WAVETEK
PACIFIC MEASUREMENTS, INC.

Pulsed Frequency Response Testing

0.03 to 40GHz

Application Note Number AN25

OVERVIEW

Swept frequency testing is commonly used to quickly display gain, power output, or return loss as a function of frequency.

Active microwave devices or systems which are pulse modulated in normal use often must be tested under pulsed conditions. Pulse modulated testing places peculiar demands on a swept measurement system since most power sensors will not respond adequately to pulse modulated signals when frequency is swept.

The Wavetek Pacific Measurements, Inc. (W-PMI) Series 8500 will measure the peak power of a pulse modulated signal anywhere within its frequency range of 30MHz to 40GHz. When combined with a suitable display system, the 8500 allows swept frequency measurements to be made under pulse modulated conditions.

POWER SENSOR LIMITATIONS

Conventional power sensors place severe limitations on sweep testing when pulse modulation is employed.

The measurement of peak power is usually desired. Heat sensing devices such a thermistors respond to average power. Average power is related to peak power as a function of pulse shape and repetition rate. An average power measurement is an indirect and inaccurate indication of peak power. Worse yet, most heat sensing devices are slow. If frequency is swept, sweep rates must be very slow to obtain useful data.

Diode detectors can respond to pulse modulated power. For fast swept frequency testing however, a means of accurately sensing the peak output of a diode detector is needed. The W-PMI Series 8500 Peak Power Meter was designed to do just this.

HOW THE 8500 MEASURES PEAK POWER

The 8500 overcomes the limitations of conventional power sensors. It detects, samples, and stores the peak (or other instantaneous) value of a pulsed microwave signal (see Figure 1).

The stored sample is available both as a digital value and as a dc voltage proportional to dBm.

By converting the peak power of a microwave pulse to a dc voltage, the 8500 makes fast swept frequency microwave measurements possible under pulse modulation conditions. This means that sweep rates can be fast enough for real-time display while tuning is performed. Fast sampling rates are also desirable in automated systems.

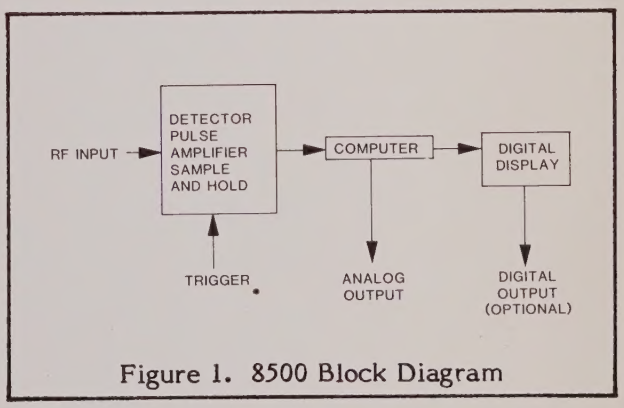


Figure 1. 8500 Block Diagram

COMBINING THE 8500 WITH THE W-PMI SERIES 1038 SWEPT MEASUREMENT SYSTEMS

A fast, accurate pulsed swept measurement system can be assembled by combining the 8500 and the W-PMI Series 1038 Systems with Automemory (see Figure 2).

Automemory stores the tracking errors of the measurement system and automatically subtracts them from the displayed data.

Since the 8500 converts the measured data to a voltage proportional to dBm, the V20 linear amplifier must be used in a Model 1038-H/V system. The Model 1038-NS20 and 1038-N10 systems are already configured to accept the peak power input from the 8500.

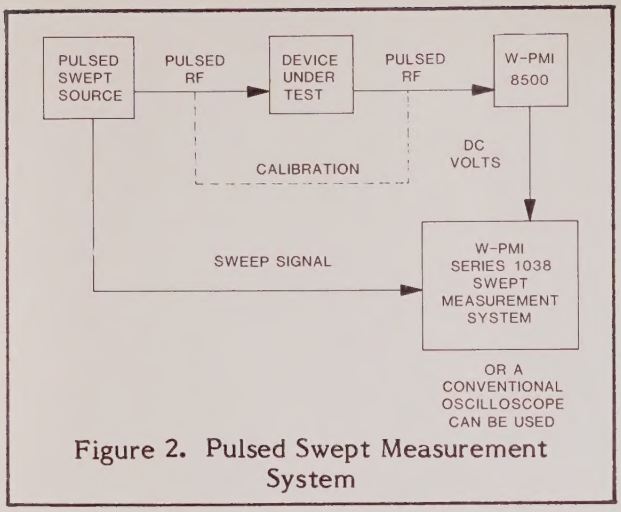


Figure 2. Pulsed Swept Measurement System

USE OF THE 8500 WITH AN ORDINARY OSCILLOSCOPE

A comparatively inexpensive pulsed swept measurement system can be assembled by displaying the output of the 8500 on a conventional oscilloscope, and then marking the system tracking errors on the CRT display in grease pencil for visual correction.

USE OF THE 8500 IN COMPUTER CONTROLLED SYSTEMS

The 8500 contains a digital interface compatible with IEE STD 488-1978. This allows the instrument to be incorporated in measurement systems controlled by a computer or calculator (see Figure 3). In such a system, the computer will normally deliver a trigger to the 8500. The trigger delay can be digitally controlled. The 8500's power reading is delivered in ASCII code.

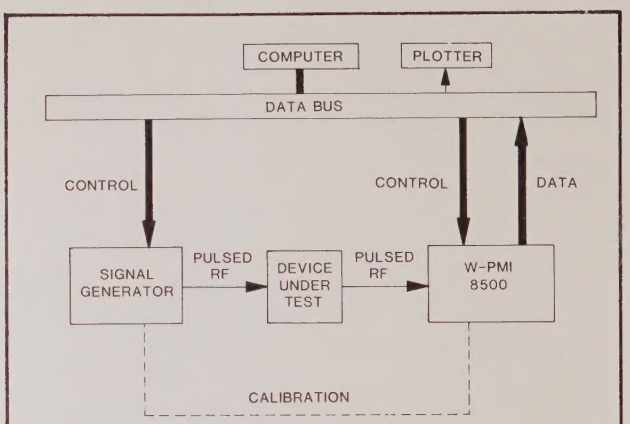


Figure 3. Computer Controlled System

CAPSULE SUMMARY OF 8500 SPECIFICATIONS

Frequency Range: 30MHz to 40GHz

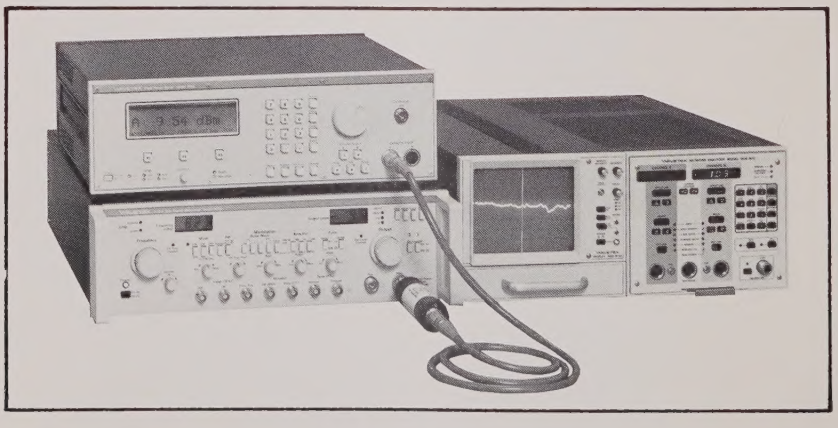
Power Range: +20 to -20dBm (Pulse)
+20 to -40dBm (CW)

Minimum Pulse Width: 15nsec

Linearity, dBm Range: ±2%

Analog Output, dBm Range: 100mV/dB

Calibrator: 1GHz



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